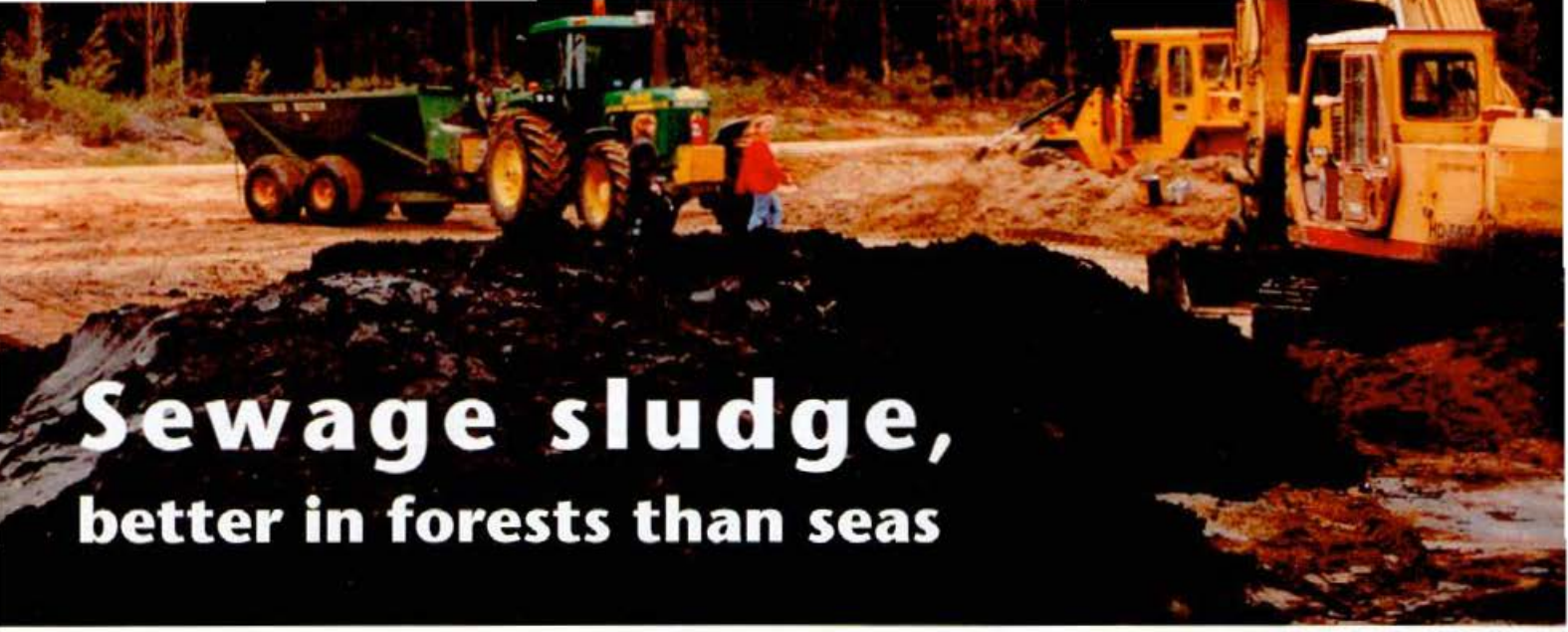

# Sewage sludge, better in forests than seas

Preliminary results are emerging from a project aimed at developing guidelines for fertilising radiata pine plantations with biosolids (sewage sludge). The project is using field and laboratory studies to determine the quantities of biosolids that can be applied without environmental risk in specific circumstances, and what boost to tree growth can be expected.

With funding from Sydney Water, the research is being conducted by Philip Polglase and Michael Robinson from CSIRO Forestry and Forest Products, together with State Forests of New South Wales and the University of Melbourne.

Until recently, biosolids were regarded as waste, rather than a nutrient-rich organic resource. Up to the late 1980s, more than 90% of the sludge from Sydney's sewage plants was pumped into the ocean and the rest incinerated. Ocean disposal ended in 1993, and now about 80% of the city's biosolids output is reused, mostly as fertiliser in agriculture and horticulture. So far only about 5% is used to fertilise plantation forest, but this proportion is set to rise.

According to Polglase, forests have distinct advantages over agricultural land as sites for fertilisation with biosolids. In agricultural applications, biosolids have to be ploughed into the soil before each crop is planted; no such restrictions exist in plantation forests. Also, there is less risk of contaminants such as heavy metals and pathogens finding their way into food.

For their field studies, the researchers spread biosolids over experimental plots in Wingello State Forest, south of Sydney, at about 30 dry tonnes per hectare. The pines were 22 years old and grew on sandy soil low in nitrogen, phosphorus and organic matter.

The biosolids were chosen for their varying chemical and physical characteristics, but each contributed more than 1000 kilograms of nitrogen per hectare and about 800 kg of phosphorus per hectare. Key questions are how quickly the material decomposes and releases its nitrogen and phosphorus, the speed of movement of the released nutrients through the soil, and how these rates are affected by climate, soil type and the chemistry of biosolids.

The first year's findings for nitrogen suggest an initial rapid loss followed by consistent continuing releases at a lower rate. This holds out the prospect that a single application could provide benefits for many years. 'We see it as a slow-release fertilisation,' Polglase says.

A major difference in the behaviour of biosolids was a much larger initial nitrogen release from the material treated with an aerobic process than from biosolids produced in anaerobic plants. Polglase says the reason for this lies in the initial chemistry of the biosolids. Aerobically-treated biosolids contained about 50% of their total nitrogen as ammonium. In this form, the nitrogen is readily washed into soil by rain and lost to the atmosphere through volatilisation. In contrast, anaerobically-treated biosolids contained only about 20% of their total nitrogen as ammonium, thus there was less available to be leached and volatilised. Polglase suspects it is also likely that aerobically-treated biosolids decompose more rapidly, and in doing so release more nitrogen. But this hypothesis is yet to be tested.

Because nitrate leaching to groundwater is the major environmental hazard, measurements of nitrate in soil water will be critical to assessment of the quantities of biosolids that can be applied safely in plantations. Consistent with the nitrogen release figures, the highest nitrate readings in the first year came from the plots treated with aerobically treated biosolids.

Field studies will continue until the end of 1996, and laboratory research will provide a detailed understanding of the processes at work. The scientists aim to use this information to produce a generalised model of the interactions of biosolids with climate, soil and forest characteristics.

*This article is extracted from* Onwood, *the newsletter of CSIRO Forestry and Forest Products. Contact: Mick Crowe, PO Box 4008, Queen Victoria Terrace, ACT 2600, (06) 281 8211, fax (06) 281 8312, email: mick.crowe@cbr.for.csiro.au.*

**In Perth, a colourful frog and the words 'Clean drains, River gains', offers a warning to intending dumpers. Other activities being undertaken by the stormwater management groups include organising working bees, investigating alternative car washing practices, and educating neighbours about the correct disposal of swimming pool water, oil and poisons.**